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# What Makes Lessons Learned Programs Work?

*...Influencing Recipient Behaviors*

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**SELLS April 2006 Workshop**



The Society  
for Effective

Lessons Learned Sharing

# Motivation

- Lessons Learned systems are intuitively attractive – Learn from the mistakes of others
- Organizations attempt to promote this type of vicarious learning through implementing computer-based information technologies to retain and “make available” *lessons learned*

Brown et al. 1998; McDermott 1999; Mohrman et al. 2003; Olivera 2000, Weber & Aha, 2001

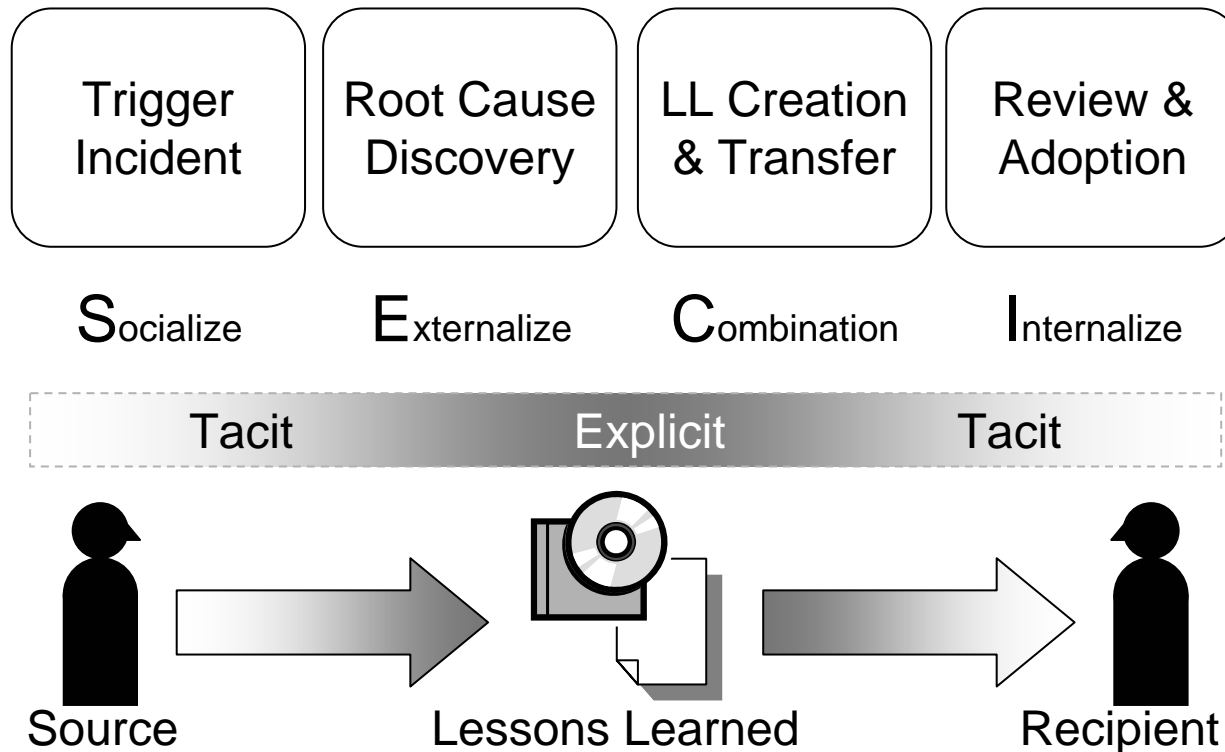
- A review of 41 formal lessons learned systems have shown that these systems rely on different strategies to support the reuse of these lessons learned.
  - ❑ 31 U.S. Government non-military
  - ❑ 7 Military
  - ❑ 3 Private

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# Outline

- Lessons Learned Process Model
  - Defining Recipient Behaviors
  - Hypothesis Building & Testing
  - Other Analyses
  - Conclusions & Implications
-

# Lessons Learned Process Model



- 41 LL systems reviewed via available documentation

| System Name | Organization Name | Contact | Focus | Access (Y/N) | Hyperlink | Comments | Potential Data Collection |
|-------------|-------------------|---------|-------|--------------|-----------|----------|---------------------------|
|             |                   |         |       |              |           |          |                           |

Trigger  
Trigger Importance

## Causal Investigation

- Recommendation
- Capture & Integrate
- Number Created
- IT Description
- Ontology Depth
- Relevance Network
- Communication Policy
- Communication Methods

| Review Process               | Number Transferred | Internalization Goal | Action/Outcome | Number Applied |
|------------------------------|--------------------|----------------------|----------------|----------------|
| 1. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 2. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 3. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 4. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 5. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 6. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 7. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 8. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 9. Review of the literature  | 10                 | 100%                 | 100%           | 10             |
| 10. Review of the literature | 10                 | 100%                 | 100%           | 10             |

- Mission or Goal
- Monitoring Policy
- Incentives
- Intermediaries

[illegible]

# Lesson Learned Program Summary

| Trigger Incident  | Root Cause Discovery | Creation & Transfer | Review & Adoption | Organization Context<br>(e.g. Mission, Monitoring, Facilitation) |
|---|----------------------|---------------------|-------------------|--|
| S   | E                    | C                   | I                 |  |
| 37<br>90%   | 22<br>54%            | 41<br>100%          | 30<br>73%         | 38<br>93%  |
| 17 (41%) of programs reviewed discussed all SECI phases |                      |                     |                   |  |

How to measure which programs are most effective and what factors influence effectiveness?

# Effectiveness = Internalization

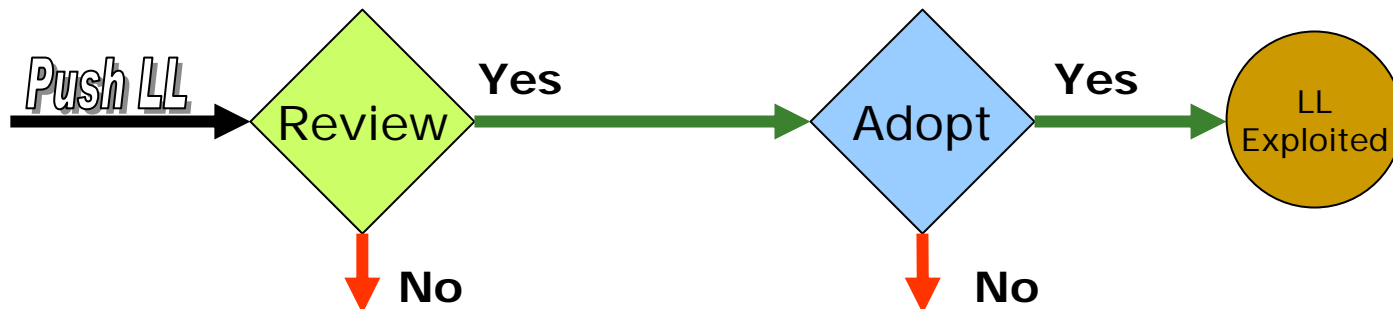
Investigate organizational interventions that impact two recipient behaviors

## Information Review

- Time an individual devotes to reading and assimilating lessons learned information

## Information Adoption

- EXTERNAL
  - Lessons learned which have been acted upon by changing organizational artifacts under their direct control or influence; such as, technologies (e.g.; process, products) or routines (e.g.; procedures, work plans, training manuals)
- INTERNAL
  - Alternatively, an individual recipient may simply retain the information within their *internal* schema and take action when they are presented with a similar situation avoiding the incident that triggered the original lesson learned



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# Scientific Method

- Observe phenomena
  - Formulate hypotheses to explain phenomena and predict results
  - Test Hypotheses
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# Lesson Learned Systems Applications

Insight and experiences gained regarding Lessons Learned System Planning, Implementing, Assessing, and Improving

## Personal Involvement - Action Research Perspective

- Planned and Implement New Product Development LL System
- Consultant for (2) LL System Development Teams
- SELLS Member: bi-annual meetings & regular conference calls

## Published Sources

- INEEL Report: History & Assessment of DOE Site System
  - GAO Report of NASA LLIS
  - Construction Industry Institute Research Report 123-11
  - Kentucky DOT Report: development of an on-line system
  - NTSB Website
-

# What Influences Internalization?

## ■ Reinforcing Activities

- Clear *Expectations* to review and adopt
- *Monitoring* whether it happens

## ■ Facilitation

- *Within Group*
  - manager, operator, other
- *External from group*
  - Lesson Learned Coordinator

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# What Influences a Recipient's Behaviors

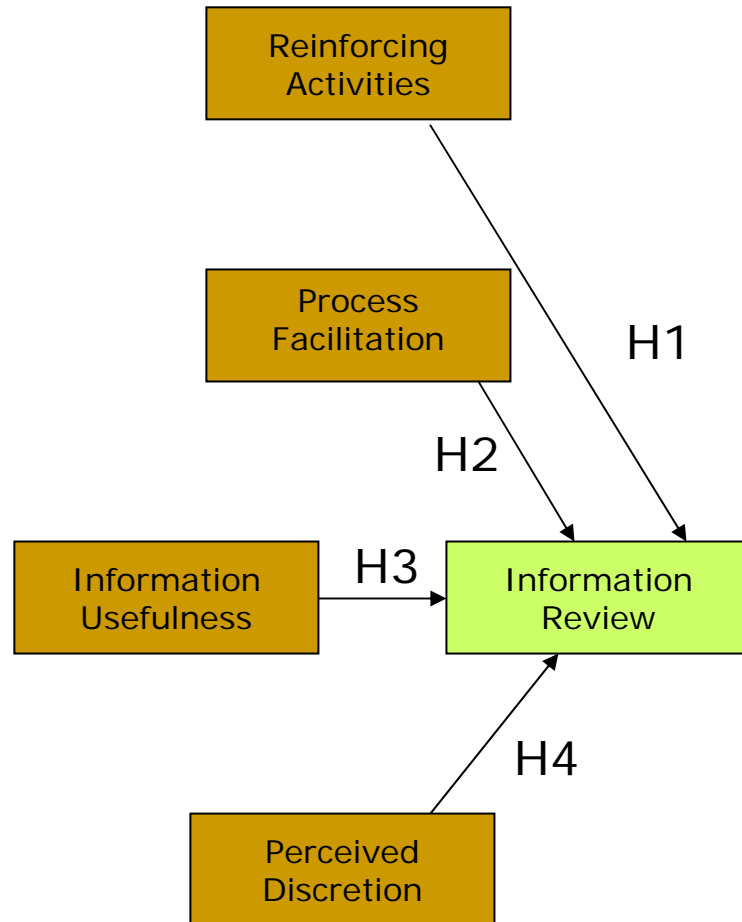
## ■ Information Usefulness

- Recipient's perception that the lessons learned are valuable, informative, and helpful in planning actions to achieve their assigned job responsibilities.

## ■ Perceived Discretion

- Perception that recipient has the opportunity and resources to *Review* and *Adopt* on information.
    - Resources
    - Site Knowledge
    - Similarity to other Sites
-

# Stage 1: Information Review



H1: Increased metastructuring activities will increase information review.

H2: Increased internalization process facilitation will increase information review.

H3: Increases information usefulness increases information review.

H4: An increase in a recipient's perceived discretion will increase information review.

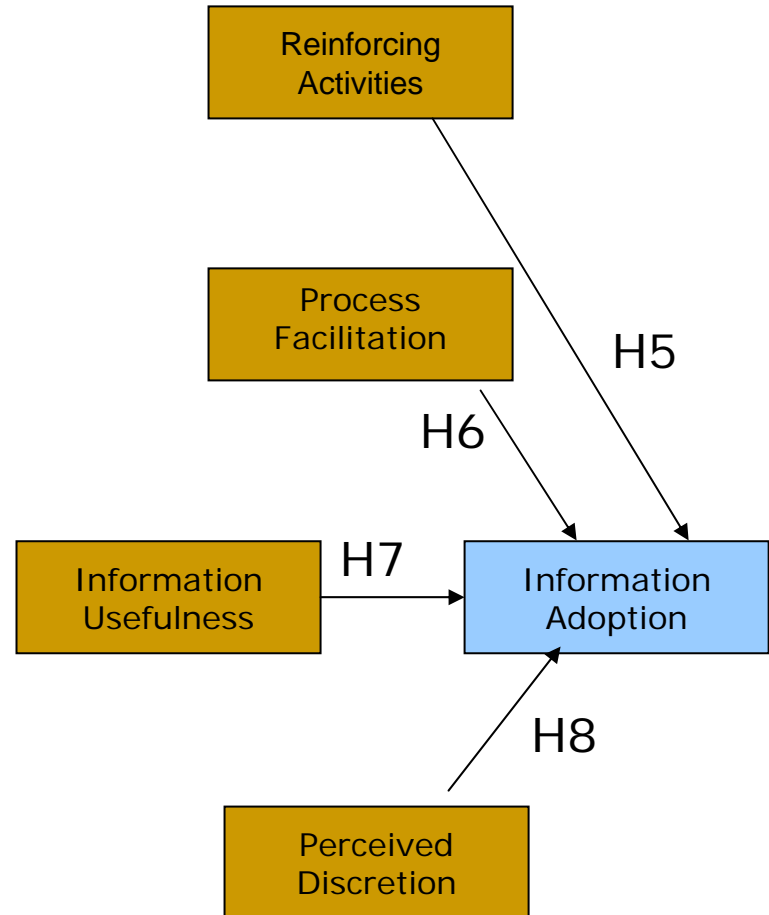
# Stage 2: Information Adoption

H5: Increased reinforcing activities will increase information adoption.

H6: Increased process facilitation will increase information adoption.

H7: Increased information usefulness increases information adoption.

H8: An increase in a recipient's perceived discretion will increase information adoption.



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# Testing Hypotheses: Study Design

## ■ Choose Sites

- 4 sites chosen based on how they *facilitate* and *reinforce* the lessons learned process
- Unfortunately 2 dropped out

## ■ Site Visit

- Characterize System & Distribution Mechanism
  - Interviews with lessons learned coordinators
  - Interviewed several Lessons learned recipients

## ■ Recipient Survey

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# Data Collection: Interviews



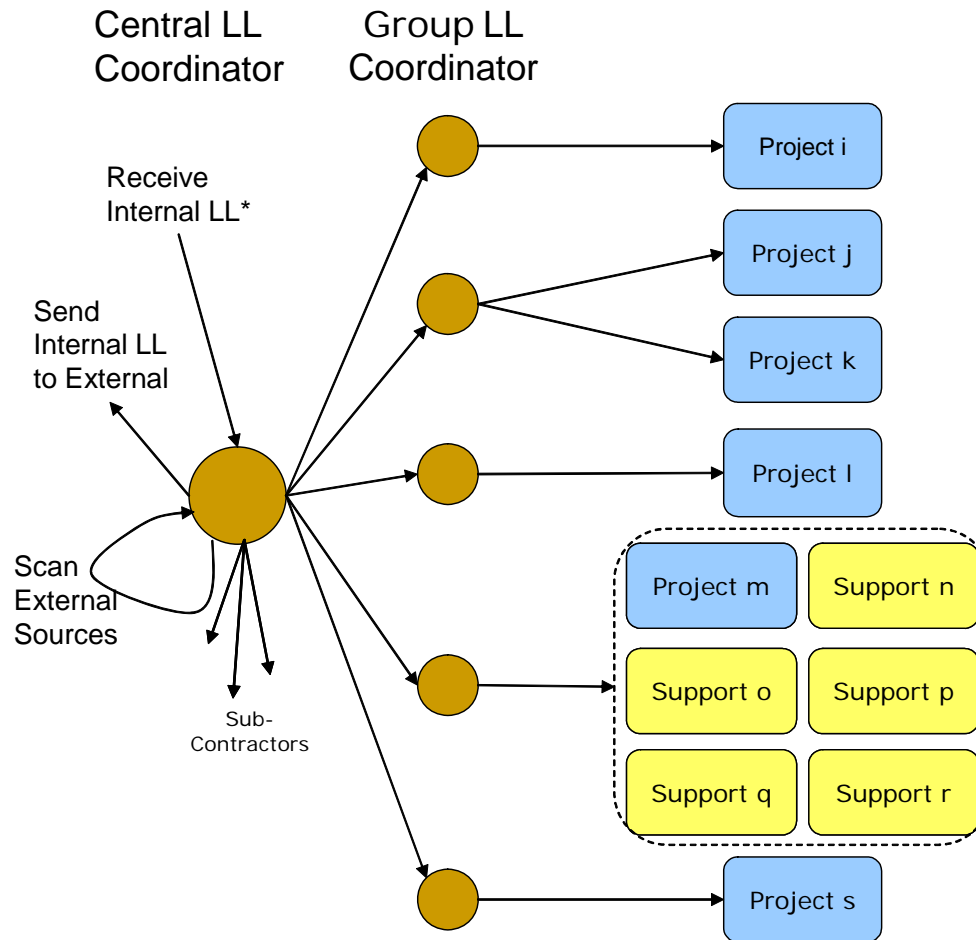
## Site A

| Name                   | Original time   | Edited time     | Time Reduced   | Efficiency |
|------------------------|-----------------|-----------------|----------------|------------|
| 0 Site A LLC 13ap05    | 1:43:38         | 1:37:21         | 0:06:17        | 94%        |
| 1 LLC 15ap05           | 0:33:14         | 0:28:06         | 0:05:08        | 85%        |
| 2 LLC 15ap05           | 0:53:18         | 0:48:42         | 0:04:36        | 91%        |
| 3 LLC 15ap05 pt1 & pt2 | 0:47:35         | 0:45:01         | 0:02:34        | 95%        |
| 4 LLC 15ap05           | 0:37:37         | 0:30:09         | 0:07:28        | 80%        |
| 5 LLC 18ap05           | 1:06:59         | 0:58:05         | 0:08:54        | 87%        |
| Site a LLR01 29AP05    | 1:00:59         | 0:37:38         | 0:23:21        | 62%        |
| Site a LLR02 29AP05    | 0:42:37         | 0:36:48         | 0:05:49        | 86%        |
| Site a LLR03 02MY05    | 0:28:38         | 0:21:53         | 0:06:45        | 76%        |
| Site a LLR04 02MY05    | 0:28:13         | 0:25:14         | 0:02:59        | 89%        |
| Site a LLR05 02MY05    | 0:18:35         | 0:17:15         | 0:01:20        | 93%        |
| Site a LLR06_07 02MY05 | 0:24:11         | 0:21:45         | 0:02:26        | 90%        |
| Site a LLR08 02MY05    | 0:19:18         | 0:16:28         | 0:02:50        | 85%        |
| Site a LLR09 03MY05    | 0:12:17         | 0:11:05         | 0:01:12        | 90%        |
| Site a LLR10_11 03MY05 | 0:32:53         | 0:29:08         | 0:03:45        | 89%        |
| Site a LLR12 03MY05    | 0:40:25         | 0:34:57         | 0:05:28        | 86%        |
| Site a LLR13 03MY05    | 0:29:09         | 0:26:49         | 0:02:20        | 92%        |
| Site a LLR14 29AP05    | 0:38:47         | 0:24:13         | 0:14:34        | 62%        |
| <b>TOTALS</b>          | <b>11:58:23</b> | <b>10:10:37</b> | <b>1:47:46</b> | <b>85%</b> |

## Site B

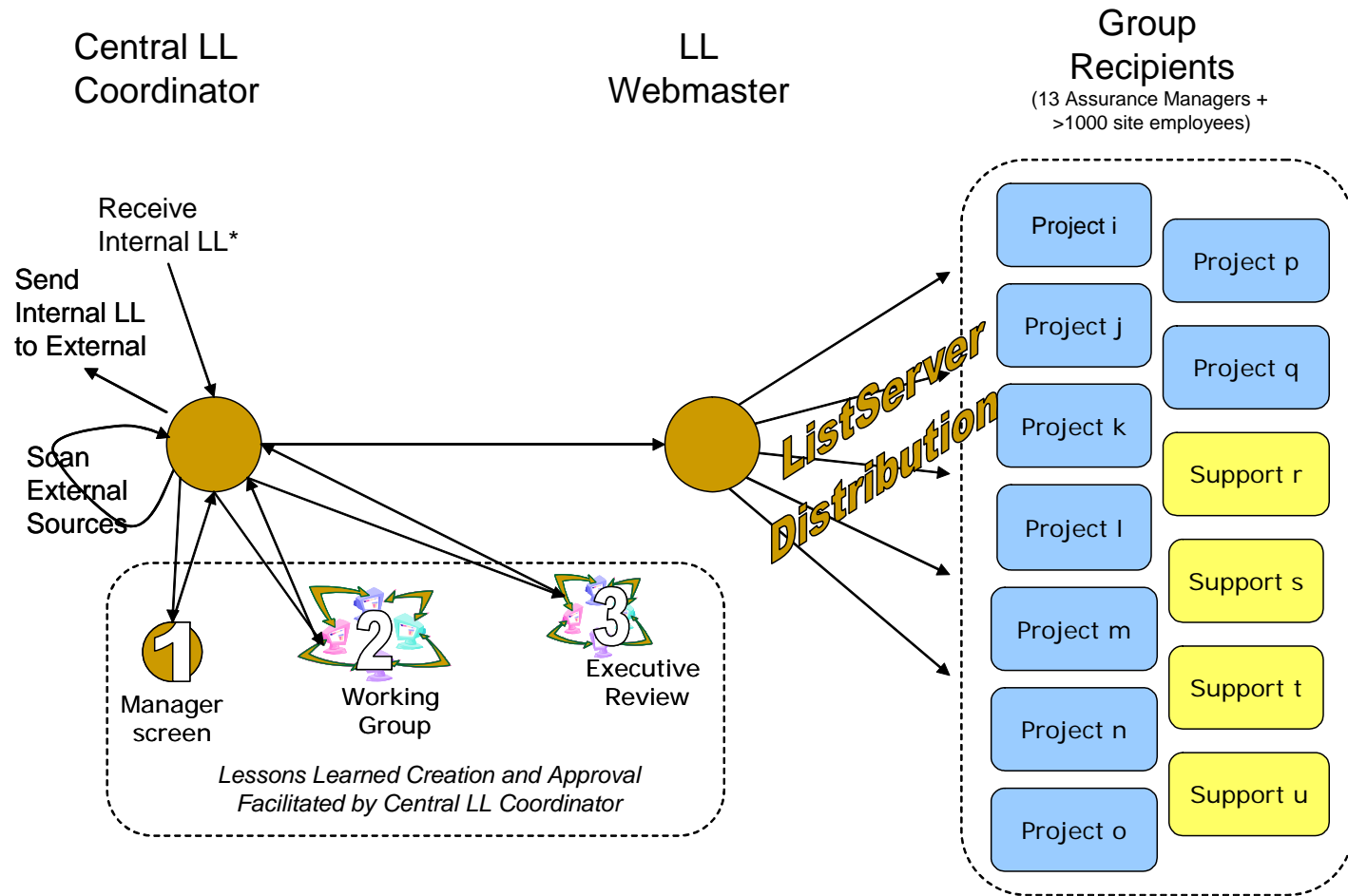
| Name                         | Original time  | Edited time    | Time Reduced   | Efficiency |
|------------------------------|----------------|----------------|----------------|------------|
| LLC Pre meeting 2005_06_01   | 1:39:09        | 1:33:12        | 0:05:57        | 94%        |
| 005_E_001_jrv_2005_06_28.dvf | 0:24:33        | 0:19:20        | 0:05:13        | 79%        |
| 005_E_002_jrv_2005_06_28.dvf | 0:31:53        | 0:16:39        | 0:15:14        | 52%        |
| 005_E_003_jrv_2005_06_28.dvf | 0:14:00        | 0:11:08        | 0:02:52        | 80%        |
| 005_E_004_jrv_2005_06_28.dvf | 0:28:22        | 0:12:12        | 0:16:10        | 43%        |
| 005_E_005_jrv_2005_06_29.dvf | 0:25:27        | 0:24:53        | 0:00:34        | 98%        |
| 005_E_006_jrv_2005_06_29.dvf | 0:17:29        | 0:17:02        | 0:00:27        | 97%        |
| 005_E_007_jrv_2005_06_29.dvf | 0:16:43        | 0:14:31        | 0:02:12        | 87%        |
| 005_E_008_jrv_2005_06_29.dvf | 0:15:14        | 0:13:19        | 0:01:55        | 87%        |
| 005_E_009_jrv_2005_06_29.dvf | 0:21:37        | 0:21:10        | 0:00:27        | 98%        |
| 005_E_010_jrv_2005_06_29.dvf | 0:13:00        | 0:13:00        |                | 100%       |
| 005_E_011_jrv_2005_06_29.dvf | 0:20:47        | 0:20:04        | 0:00:43        | 97%        |
| 005_E_012_jrv_2005_06_30.dvf | 0:13:21        | 0:13:21        |                | 100%       |
| 005_E_013_jrv_2005_06_30.dvf | 0:14:48        | 0:14:48        |                | 100%       |
| 005_E_014_jrv_2005_06_30.dvf | 0:33:46        | 0:25:38        | 0:08:08        | 76%        |
| 005_E_015_jrv_2005_06_30.dvf | 0:17:33        | 0:12:11        | 0:05:22        | 69%        |
| 005_E_016_jrv_2005_06_30.dvf | 0:18:17        | 0:17:45        | 0:00:32        | 97%        |
| 005_E_017_jrv_2005_06_30.dvf | 0:20:11        | 0:17:33        | 0:02:38        | 87%        |
| <b>TOTALS</b>                | <b>7:26:10</b> | <b>6:17:46</b> | <b>1:08:24</b> | <b>85%</b> |

# Site A Distribution Method





# Site B Distribution Method



- Created and Administered through Survey Monkey

**Test Lesson Learned Survey v2** - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail News RSS Feeds Google GOF\_20F1\_13W

Address http://www.surveymonkey.com/show/PAGE2?ID=Survey(2314)MKT3CABMS-CZIC+44B-A9B-B4T1E87D22.apd?m=1514106173&CO\_NCF\_TCEI\_13W

### Test Lesson Learned Survey v2

Edit this survey >>

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#### 3. of 10.

Indicate how often you have taken action to adopt a lesson learned received from the (PROGRAM) in the past year.

|                                    | Never<br><small>(less than 10%<br/>of the time)</small> | Almost Never<br><small>(about 1/4 of<br/>the time)</small> | Rarely<br><small>(about 1/2 of<br/>the time)</small> | Sometimes<br><small>(about 3/4 of<br/>the time)</small> | Often<br><small>(about more than<br/>90% of the<br/>time)</small> | Always                |
|------------------------------------|---|--|--|---|---|-----------------------|
| I have adopted lessons learned by: | <input type="radio"/>                                   | <input type="radio"/>                                      | <input type="radio"/>                                | <input type="radio"/>                                   | <input type="radio"/>   | <input type="radio"/> |

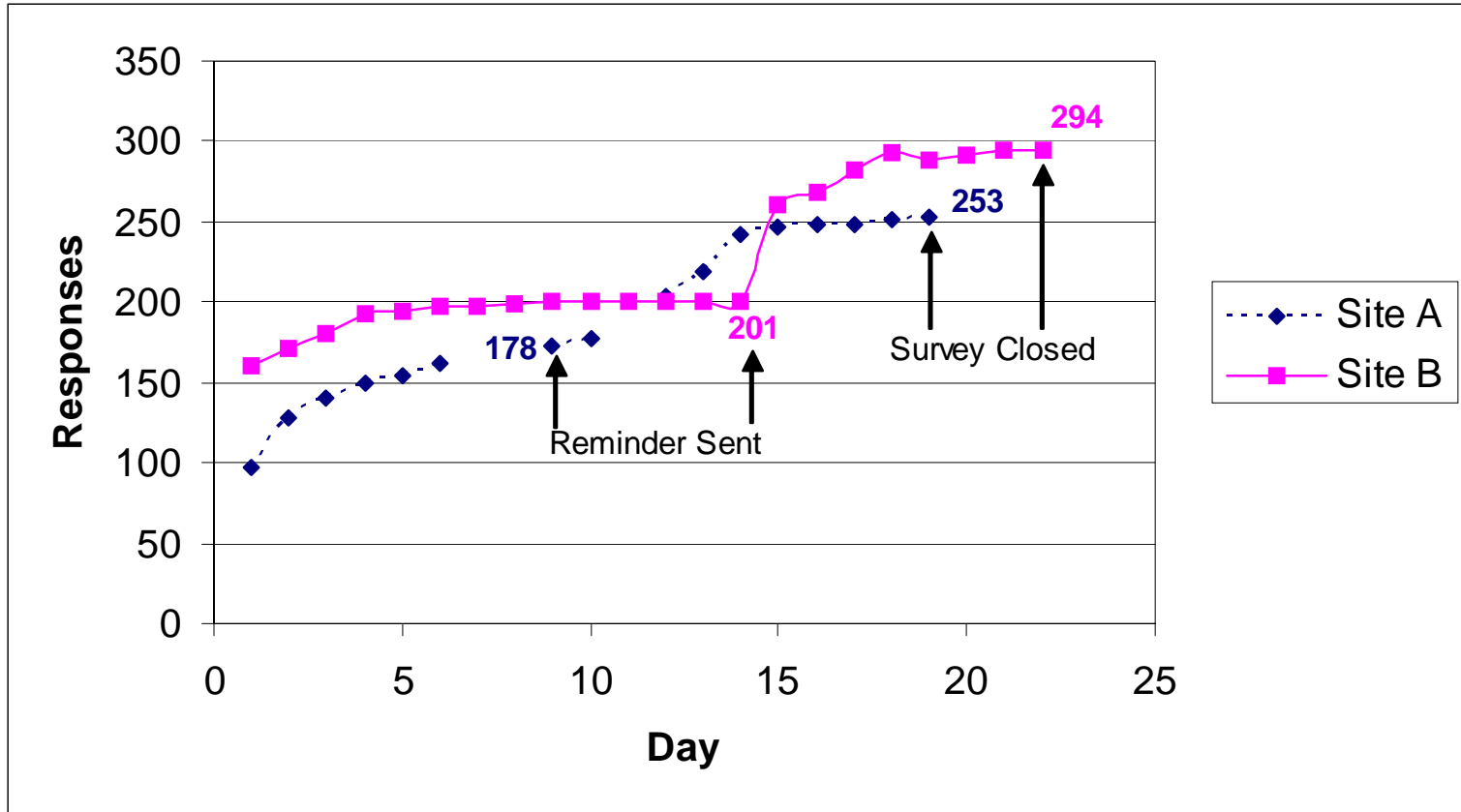
For this question consider only those lessons learned received from the (PROGRAM) that you have adopted in the past year. (*Note:* The total of these percentages may add to more than 100% since several actions may be taken for a single lesson learned.)

|   | Never<br><small>(less than 10% of the time)</small> | Almost Never<br><small>(less than 1/4 of the time)</small> | Rarely<br><small>(about 1/2 of the time)</small> | Sometimes<br><small>(about 3/4 of the time)</small> | Often<br><small>(about 90% of the time)</small> | Always                |
|---|---|--|--|---|---|-----------------------|
| Performing equipment maintenance                      | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |
| Re-designing equipment                                | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |
| Updating work plans or safety plans                   | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |
| Updating procedures that govern how work is performed | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |
| Improving training                                    | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |
| Instituting corrective actions                        | <input type="radio"/>                               | <input checked="" type="radio"/>                           | <input type="radio"/>                            | <input type="radio"/>                               | <input type="radio"/>                           | <input type="radio"/> |

Start | Home | Test Lesson Learned | Internet

Downloadable Disk (F:) | Next Update | Surveymonkey.com | Test Lesson Learned | 12:00 PM

# Survey Response History



# Response Rate

SITE A

| Total people on site | Total dist         | Total Response      | Response Rate |
|----------------------|--------------------|---------------------|---------------|
| 4032                 | 562                | 267                 | 48%           |
|                      | % of site surveyed | % of site Responded |               |
|                      | 14%                | 7%                  |               |

SITE B

| Total people on site | Total dist         | Total Response      | Response Rate |
|----------------------|--------------------|---------------------|---------------|
| 10000                | 1205               | 294                 | 24%           |
|                      | % of site surveyed | % of site Responded |               |
|                      | 12%                | 3%                  |               |

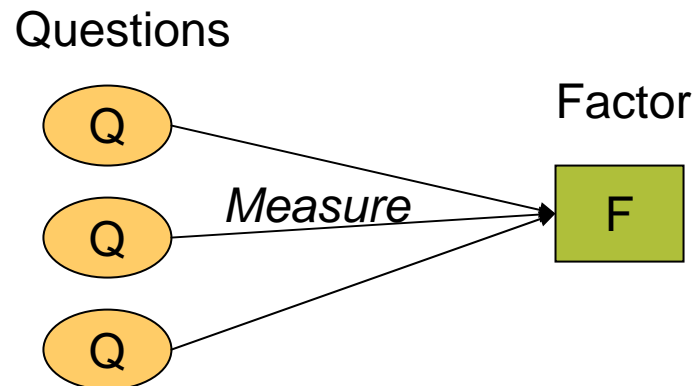
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# Data Analysis

- Step 1: Survey Analysis
    - Focus on survey responses to understand factors that influence recipient behaviors *regardless* of the site
  - Step 2: Site Contrasts
    - Test site strategies impact on survey responses
-

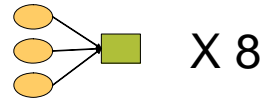
# Step 1 Survey Analysis

- Factor identifies questions that are closely related based on the recipient responses.
- These questions are combined into a factor and a factor score is generated



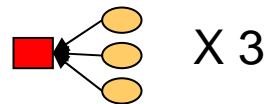
# Data Analysis: Recipient Analysis

## □ Perception Factors



- Information Usefulness
- Facilitation – Intermediary, Within Group
- Reinforcing activities – Expectations, Monitoring
- Discretion – Resources, Site Knowledge, Similarity

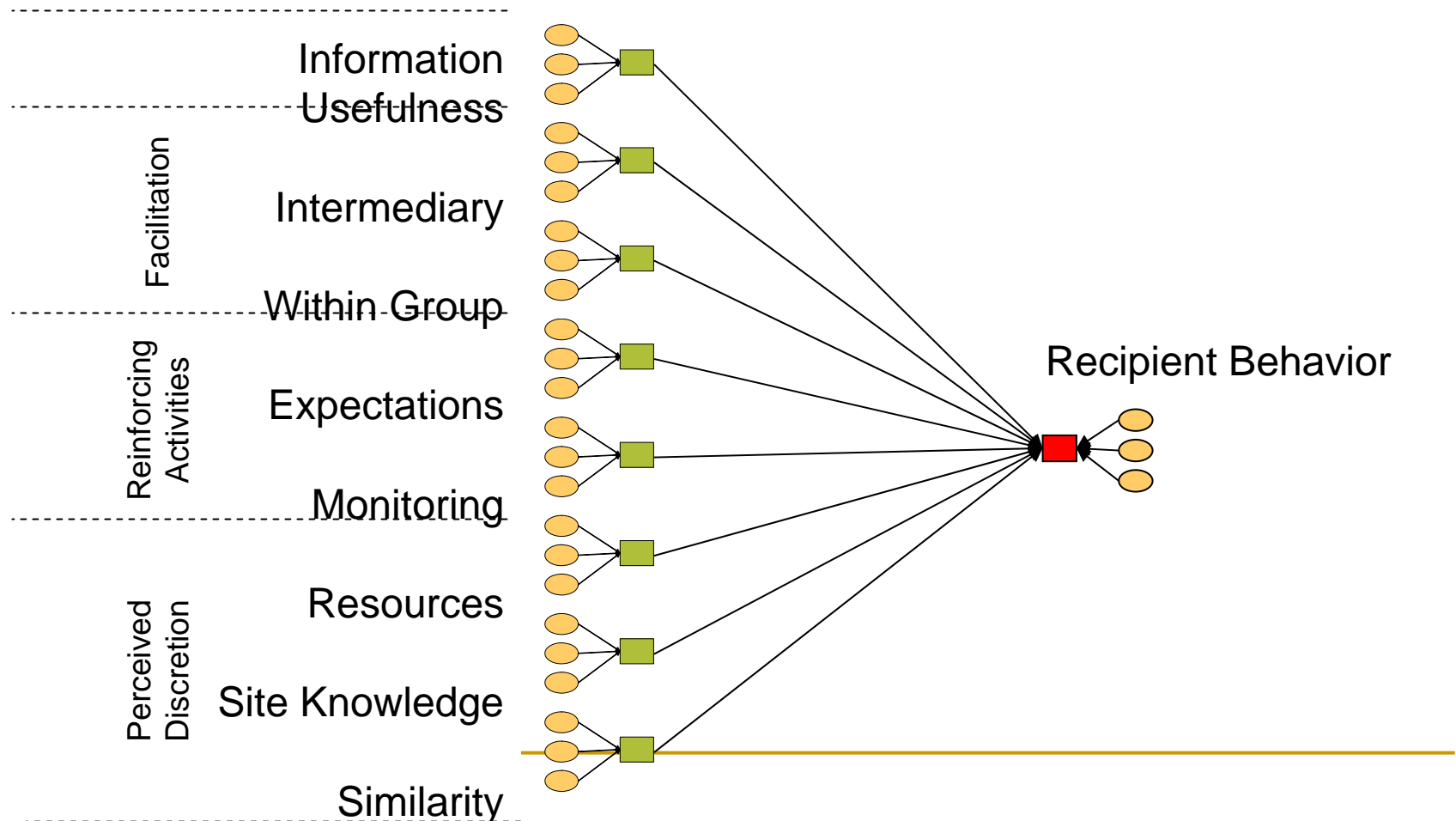
## □ Reported Behaviors



- Review
- Internal Adoption
- External Adoption

# Regression Analysis

- A method to understand if a variable significantly influences another variable





# Regression Results

w/ Only Significant factors in model AND one-sided Criteria

| Regression Analysis    |                   | Review |  |  |
|------------------------|-------------------|--------|--|--|
| # of Observations      |                   | 388    |  |  |
| $R^2$                  |                   | 0.385  |  |  |
| Info Usefulness        |                   | ***    |  |  |
| Facilitation           | Fac. Intermediary | ***    |  |  |
|                        | Fac. Group        | ***    |  |  |
| Reinforcing Activities | Expectations      | ***    |  |  |
|                        | Monitoring        | ***    |  |  |
| Perceived Discretion   | Resources         | ***    |  |  |
|                        | Site Knowledge    | ***    |  |  |
|                        | Similarity        | ---    |  |  |

\*\*\* sig @ .001

\*\* sig @ .01

\* sig @ .05

# Regression Results

w/ Only Significant factors in model AND one-sided Criteria

| Regression Analysis    |                   | Review | Adopt Internal |
|------------------------|-------------------|--------|----------------|
| # of Observations      |                   | 388    | 319            |
| R <sup>2</sup>         |                   | 0.385  | 0.376          |
| Info Usefulness        |                   | ***    | ***            |
| Facilitation           | Fac. Intermediary | ***    | *              |
|                        | Fac. Group        | ***    | ***            |
| Reinforcing Activities | Expectations      | ***    | ***            |
|                        | Monitoring        | ***    | *              |
| Perceived Discretion   | Resources         | ***    | ***            |
|                        | Site Knowledge    | ***    | **             |
|                        | Similarity        | ---    | ---            |

\*\*\* sig @ .001

\*\* sig @ .01

\* sig @ .05

# Regression Results

w/ Only Significant factors in model AND one-sided Criteria

| Regression Analysis       |                   | Review | Adopt<br>Internal | Adopt<br>External |
|---------------------------|-------------------|--------|-------------------|-------------------|
| # of Observations         |                   | 388    | 319               | 319               |
| R <sup>2</sup>            |                   | 0.385  | 0.376             | 0.167             |
| Info Usefulness           |                   | ***    | ***               | ***               |
| Facilitation              | Fac. Intermediary | ***    | *                 | ---               |
|                           | Fac. Group        | ***    | ***               | ***               |
| Reinforcing<br>Activities | Expectations      | ***    | ***               | ---               |
|                           | Monitoring        | ***    | *                 | ---               |
| Perceived Discretion      | Resources         | ***    | ***               | ---               |
|                           | Site Knowledge    | ***    | **                | **                |
|                           | Similarity        | ---    | ---               | ---               |

\*\*\* sig @ .001  
 \*\* sig @ .01  
 \* sig @ .05

All Factors Help...

What should you invest in?

What is the implication of “site knowledge”?

# Step 2: Site Strategy Contrasts

w/ Only Significant factors in model AND one-sided Criteria

Site B

Site A

| Regression Analysis       |                   | Review | Adopt<br>Internal | Adopt<br>External |
|---------------------------|-------------------|--------|-------------------|-------------------|
| # of Observations         |                   | 388    | 319               | 319               |
| R <sup>2</sup>            |                   | 0.385  | 0.376             | 0.167             |
| Info Usefulness           |                   | ***    | ***               | ***               |
| Facilitation              | Fac. Intermediary | ***    | *                 | ---               |
|                           | Fac. Group        | ***    | ***               | ***               |
| Reinforcing<br>Activities | Expectations      | ***    | ***               | ---               |
|                           | Monitoring        | ***    | *                 | ---               |
| Perceived Discretion      | Resources         | ***    | ***               | ---               |
|                           | Site Knowledge    | ***    | **                | **                |
|                           | Similarity        | ---    | ---               | ---               |

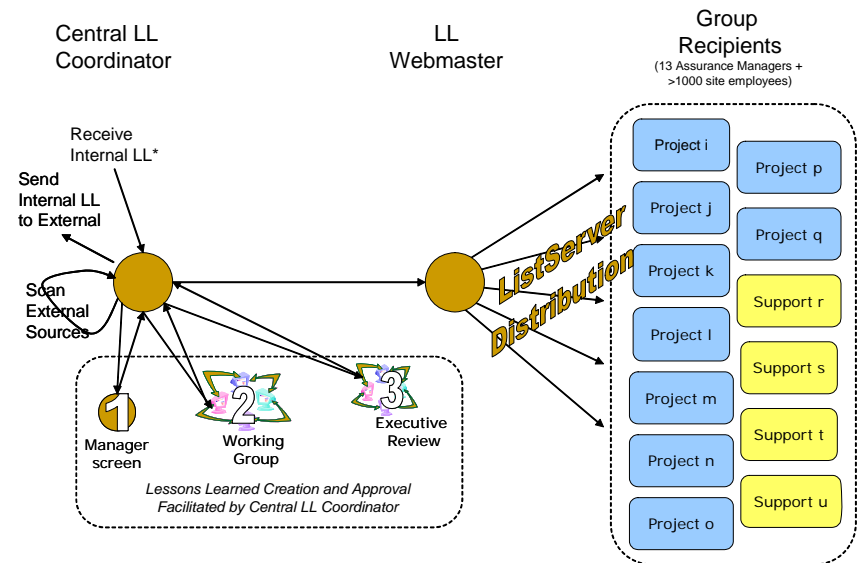
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\* sig @ .05

# Increasing Information Usefulness

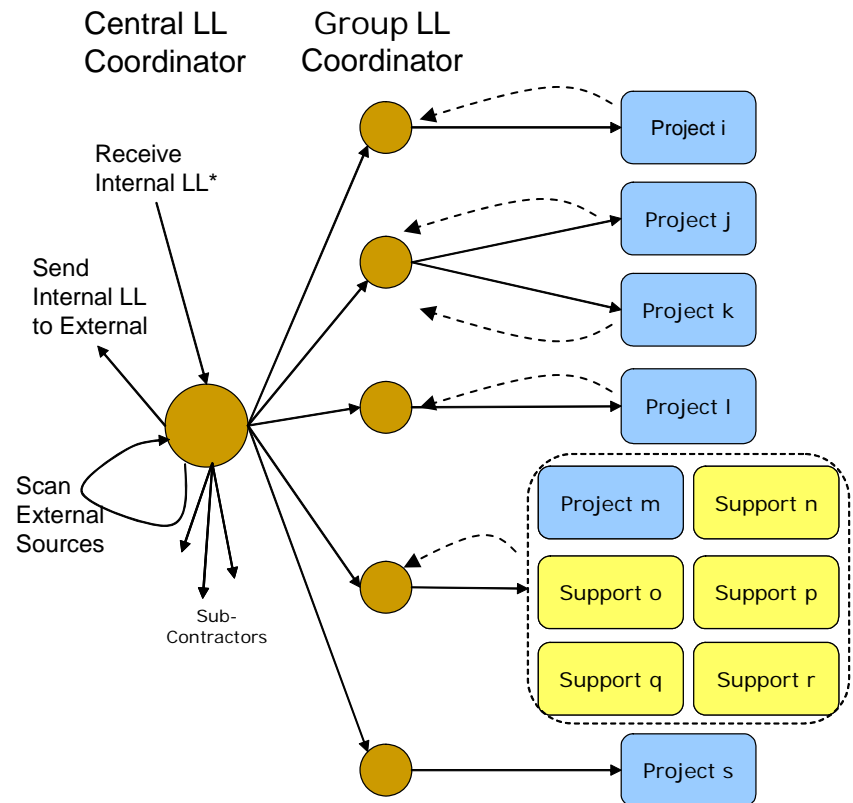
- Site B: Attempts to develop more useful information by getting a variety of perspectives, adding pictures and formatting for easy printing.
- Site A: LLC reviews lessons learned before distribution but does not edit them much, or take into account recipient perspective.
- Test: Site B's Information usefulness scores were significantly greater than Site A's



# Increasing Expectations/Monitoring

- 4 out of 5 Site B Lessons Learned Coordinators used a To: list with voting buttons, requiring a response.
- Site A simply sent out the e-mails with no voting response required
- Test: Site A's Expectations and Monitoring Scores were significantly greater than Site B's

Note: Many Other actions can effect expectations and monitoring

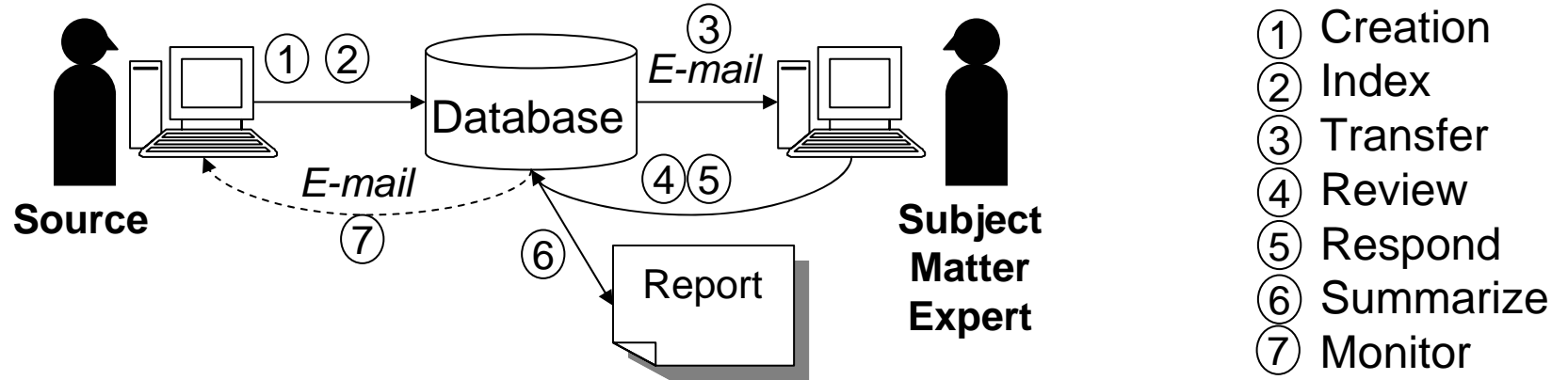


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# Evolution of Experience – The Lessons Learned Culture

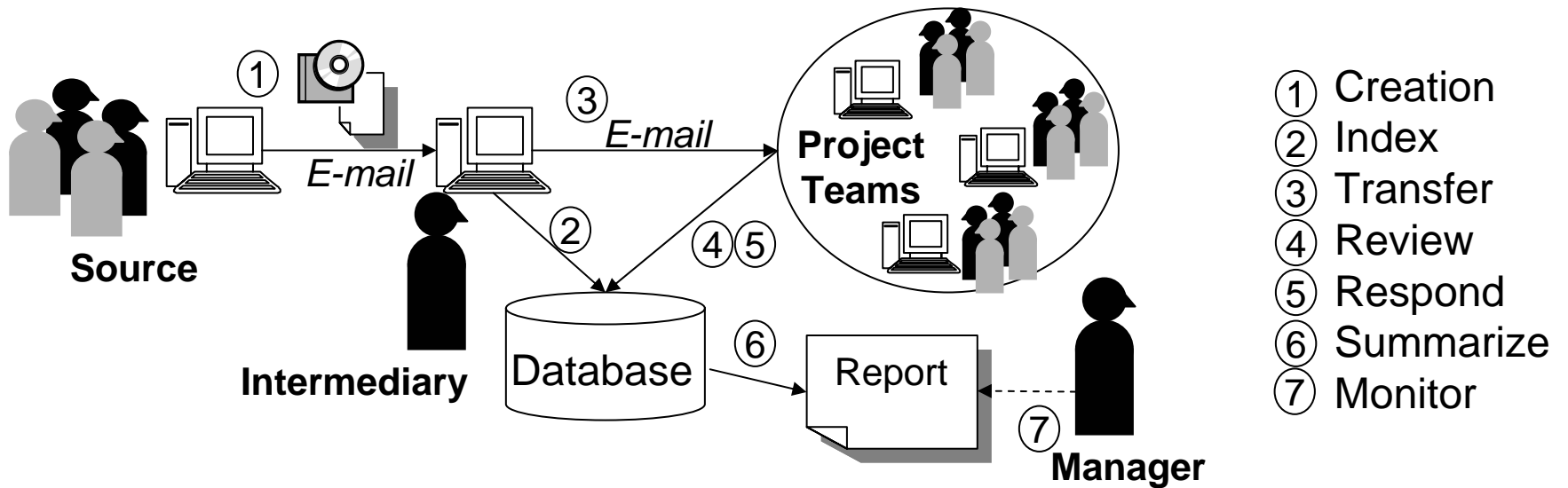
- Human Facilitation is important for Internalization
    - Consider pushing this responsibility up the organization
    - Guard against over investing in Information Technology
  - Value those with Site Knowledge because they are able identifying and adopting lessons learned
  - Focus on making useful information and targeting your recipients
    - Relevance to recipient is still a big issue on both sites
-

# Case #1

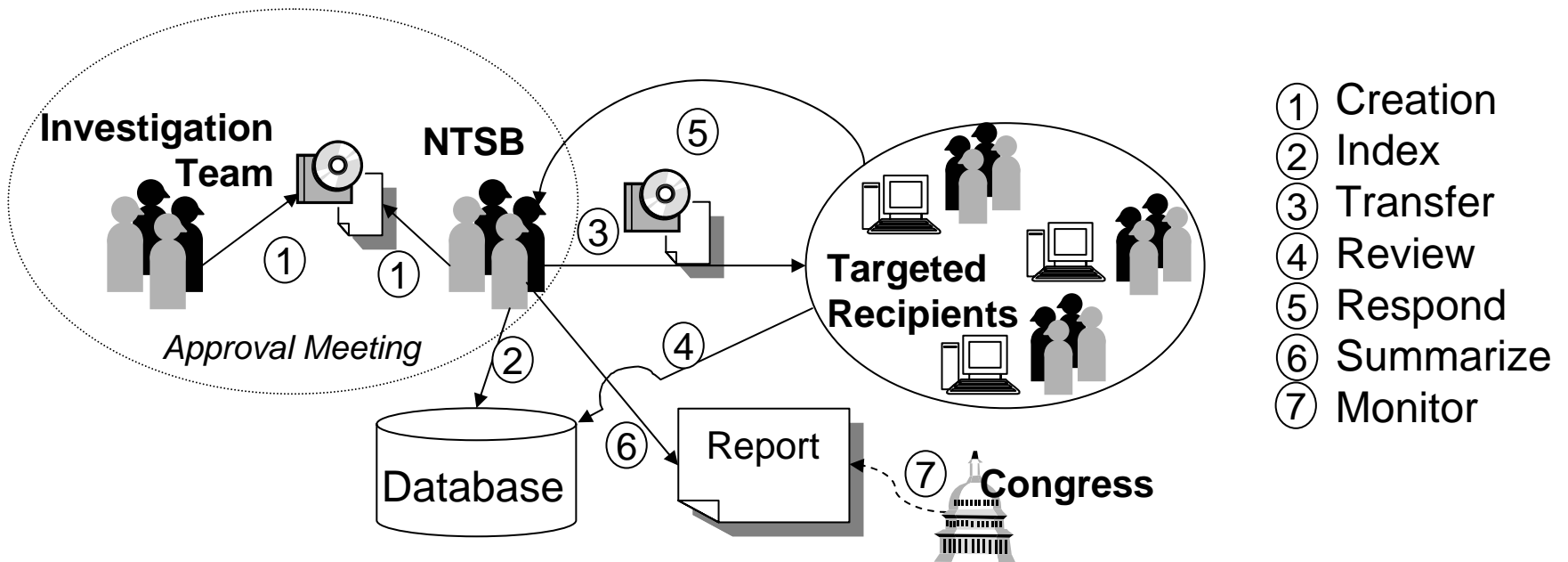




# Case #2



# Case #3



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# Site Reports

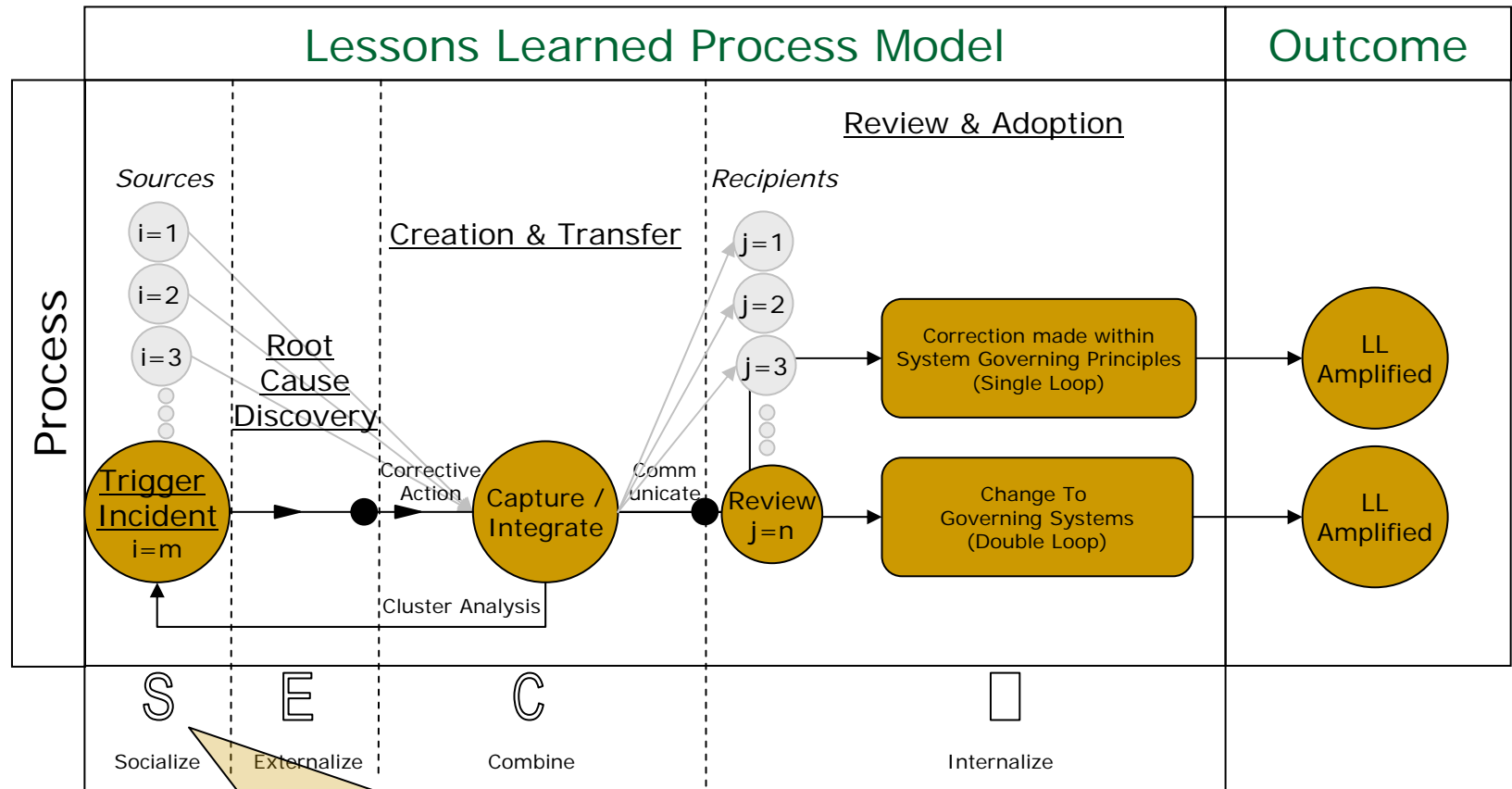
- Cover Letter
  - DOE Standard Assessment
  - Survey Results
-

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# End of Presentation

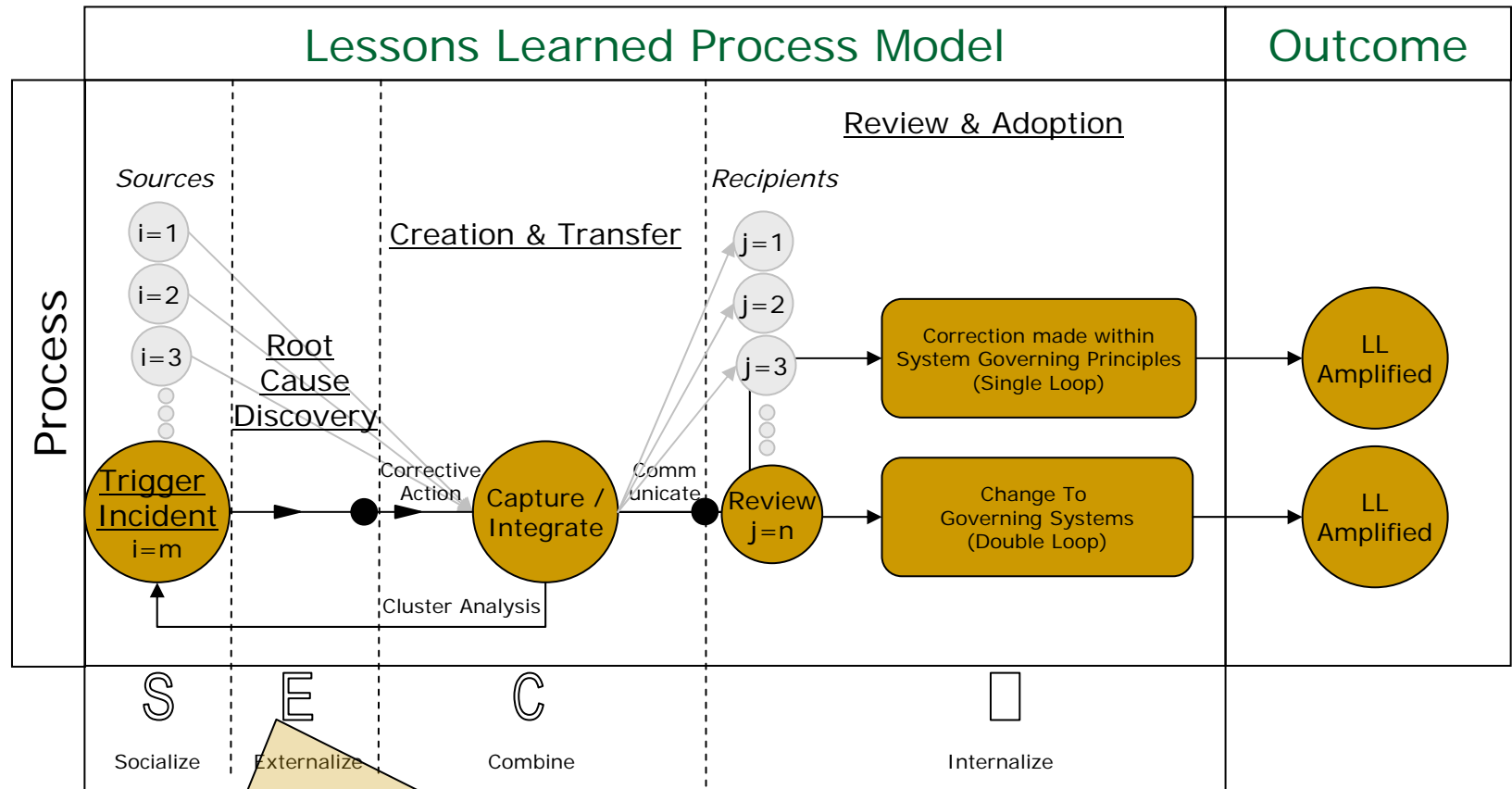
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# Lessons Learned Process Model



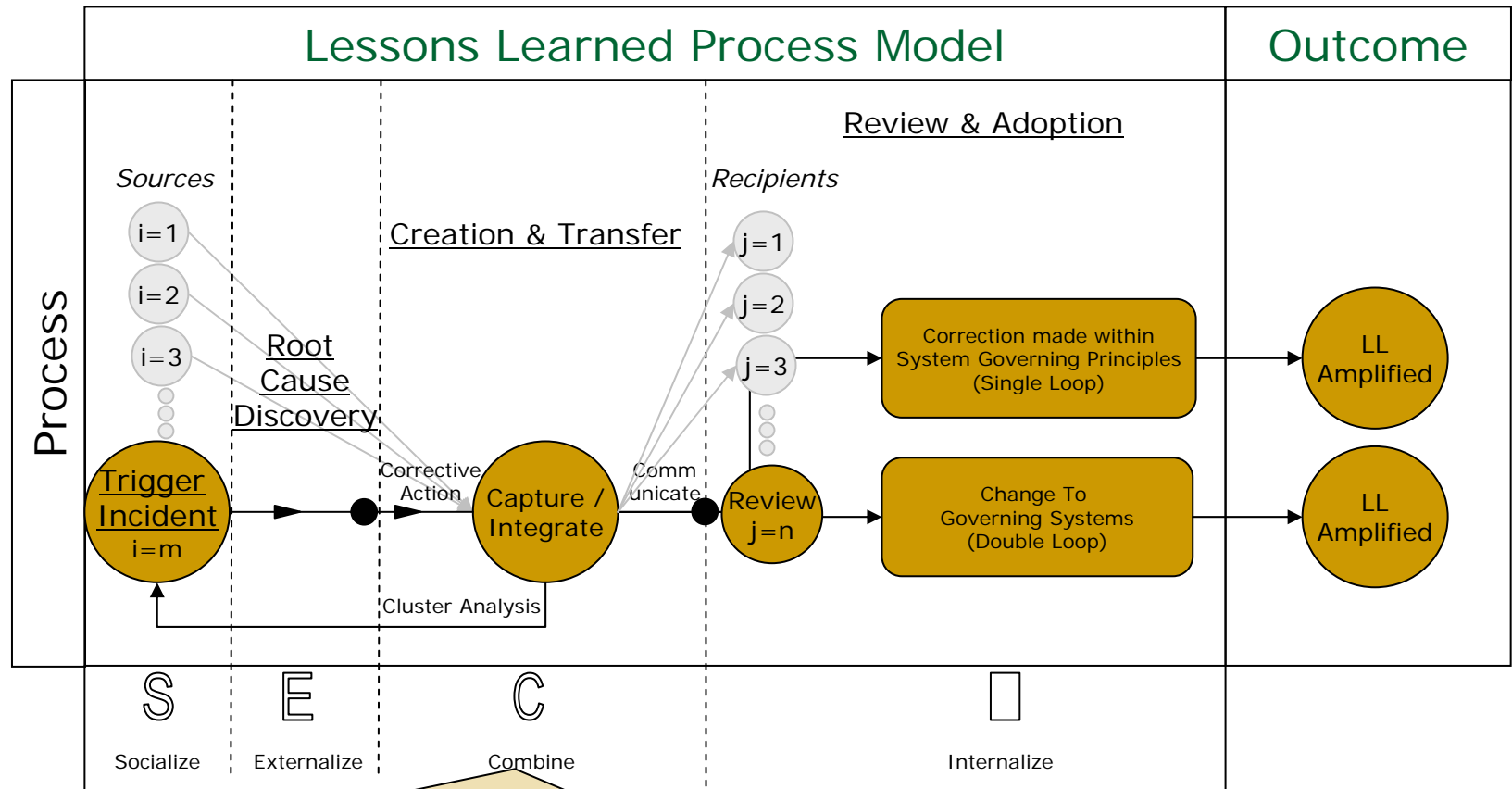
**S-socialize.** Once a trigger occurs, people collect at the trigger location to experience first-hand the tacit nature of the problem

# Lessons Learned Process Model



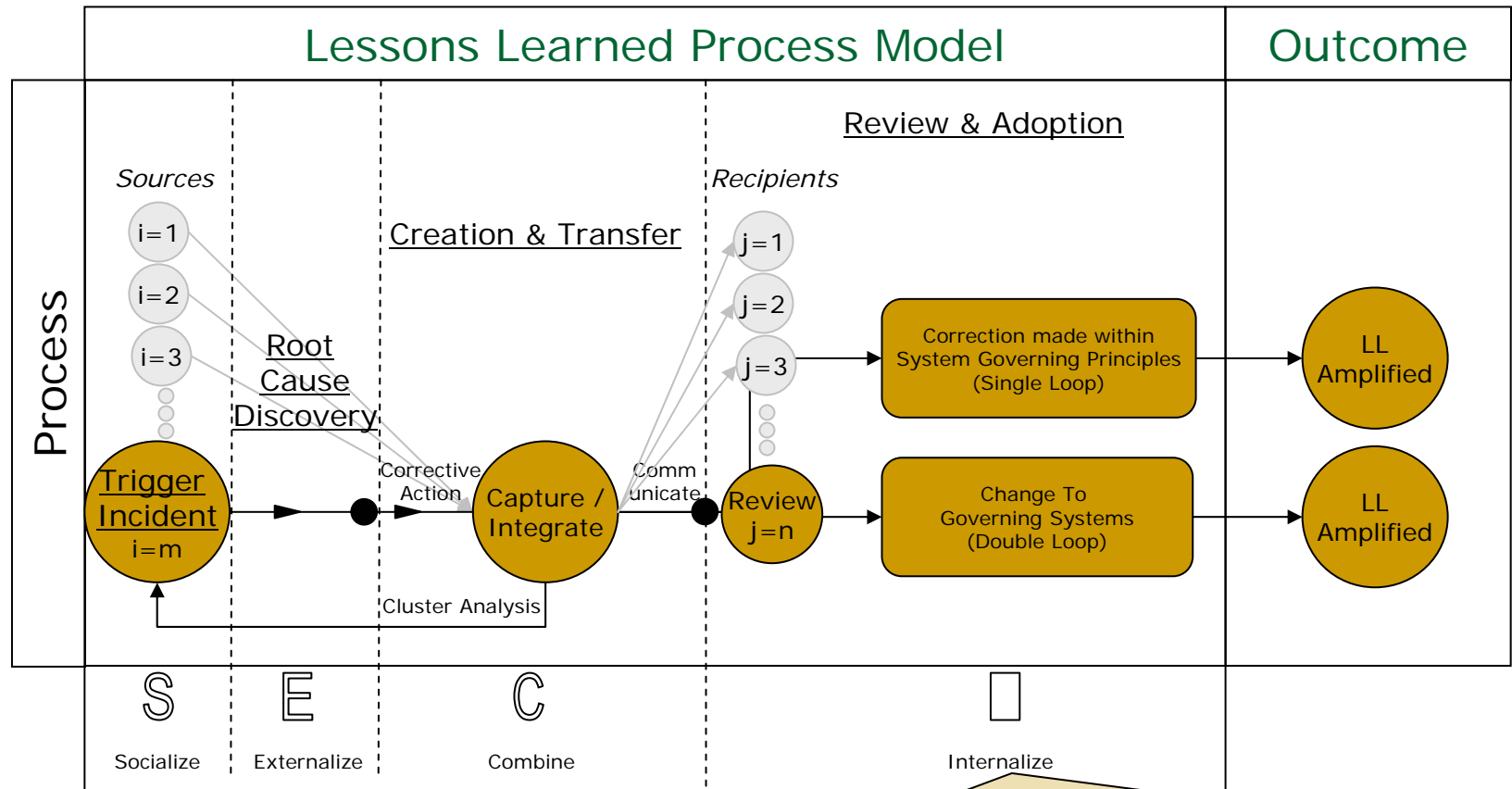
**E-externalize.** Following this event people investigate several causal chains discussing and documenting their findings along the way.

# Lessons Learned Process Model



**C-combined.** After the investigation reaches a definitive stage, the causal information is integrated to develop a set of recommendations or corrective actions, which are contained in reports, presentations, e-mails, and databases (e.g. Lesson Learned Systems).

# Lessons Learned Process Model



I-internalize. Recipients review the lessons learned and make a judgment on how to adopt the recommendations

1. *Single-Loop*: an immediate fix without changing the system
2. *Double-Loop*: changes to the system's underlying principles.